

REMARKS

In view of the above amendments and the following remarks, reconsideration and further examination are respectfully requested.

I. Amendments to the Claims

Independent claims 38, 72 and 75 have been amended to clarify features of the invention recited therein and to further distinguish the present invention from the references relied upon in the rejections discussed below.

In addition, claims 41-46, 81 and 91 have been amended to remain consistent with amended independent claim 38.

II. 35 U.S.C. § 103(a) Rejection

Claims 38-55, 72, 75, and 78-96 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Yang et al. (US 5,453,799) and Aono et al. (US 5,859,668). This rejection is believed clearly inapplicable to amended independent claims 38, 72 and 75 and the claims that depend therefrom for the following reasons.

Amended independent claim 38 recites a coding mode determining apparatus for determining at least one of a plurality of candidate coding modes of an image block, the coding modes determining at least one of (i) a division method in which the image block is divided into small blocks and (i) a picture reference direction in motion estimation for the small blocks. In addition, claim 38 recites that the apparatus includes a simple motion estimation portion that derives a first coding cost for each of the plurality of coding modes, based on a simple motion estimation for small blocks. Further, claim 38 recites that the apparatus includes a complex

motion estimation portion that derives a second coding cost for each of the plurality of coding modes, based on a complex motion estimation for the small blocks, such that based on a result of the simple motion estimation by the simple motion estimation portion, (i) when the first coding cost of a forward prediction is substantially equal to the first coding cost of a backward prediction, the complex motion estimation portion sets picture reference directions to a forward direction, a backward direction, and a bi-direction, performs complex motion estimation for the small blocks for the forward direction, the backward direction and the bi-direction, and calculates the second coding cost for the forward direction, the backward direction, and the bi-direction, and (ii) when the first coding cost of the forward prediction differs from the first coding cost of the backward prediction, the complex motion estimation portion selects one of the forward prediction and the backward prediction having a smaller first coding cost, and calculates the second coding cost for the small blocks for one of the forward direction and the backward direction corresponding to the selected one of the forward prediction and the backward prediction.

Initially, please note that the above-described 35 U.S.C. § 103(a) rejection relies on col. 8, lines 31-56 of Aono for teaching most of the features of the complex motion estimation portion, as previously recited in claim 38. However, in view of the above-identified amendments to claim 38, which clarify the structure/operation of the complex motion estimation portion, it is submitted that Aono fails to disclose or suggest the above-mentioned distinguishing features now required by the complex motion estimation portion, as recited in amended independent claim 38.

Rather, Aono merely teaches always selecting a bi-direction prediction when a forward prediction error amount is substantially equal to a backward prediction error amount (see Figs. 2-5; and col. 8, lines 31-56). Accordingly, when the forward prediction error amount is

substantially equal to the backward prediction error amount, the invention of Aono cannot achieve a high-precision encoding process, because Aono requires the bi-directional prediction to be performed rather than performing the forward prediction or the backward prediction which might result in better processing efficiency.

Thus, in view of the above, it is clear that Aono teaches always selecting a bi-direction prediction when a forward prediction error amount is substantially equal to a backward prediction error amount, but fails to disclose or suggest that based on a result of the simple motion estimation by the simple motion estimation portion, (i) when the first coding cost of a forward prediction is substantially equal to the first coding cost of a backward prediction, the complex motion estimation portion sets picture reference directions to a forward direction, a backward direction, and a bi-direction, performs complex motion estimation for the small blocks for the forward direction, the backward direction and the bi-direction, and calculates the second coding cost for the forward direction, the backward direction, and the bi-direction, and (ii) when the first coding cost of the forward prediction differs from the first coding cost of the backward prediction, the complex motion estimation portion selects one of the forward prediction and the backward prediction having a smaller first coding cost, and calculates the second coding cost for the small blocks for one of the forward direction and the backward direction corresponding to the selected one of the forward prediction and the backward prediction, as recited in claim 38.

Therefore, because of the above-mentioned distinctions it is believed clear that claim 38 and claims 39-46, 49-55, 78-85 and 88-96 that depend therefrom would not have been obvious or result from any combination of Yang and Aono.

Please note that one of the benefits of the structure required by claim 38 is that the encoding process can be executed at high speed and with high precision while considering both

of (1) a method for dividing an image block into small blocks (e.g., diversity in the space domain) and (2) a method for selecting a picture reference direction (e.g., diversity in the space domain). This benefit can be achieved because claim 38 specifies inefficient picture reference direction(s) and/or inefficient method(s) for dividing the image block into small blocks, and then excludes the specified inefficient picture direction(s) and/or method(s) for dividing the image block from candidates. After that, the claimed subject matter performs the complex motion estimation process using candidate picture reference direction(s) and/or candidate method(s) for dividing the image block, which are not excluded in the above process for specifying inefficient ones. This enables the encoding process to be executed at high speed and with high precision, although it is usually difficult to achieve a high-speed and high-precision encoding process.

In light of the discussion above, Aono does not provide the above-mentioned benefits of the structure required by claim 38, because Aono merely teaches always selecting a bi-direction prediction when a forward prediction error amount is substantially equal to a backward prediction error amount and fails to disclose or suggest that based on a result of the simple motion estimation by the simple motion estimation portion, (i) when the first coding cost of a forward prediction is substantially equal to the first coding cost of a backward prediction, the complex motion estimation portion sets picture reference directions to a forward direction, a backward direction, and a bi-direction, performs complex motion estimation for the small blocks for the forward direction, the backward direction and the bi-direction, and calculates the second coding cost for the forward direction, the backward direction, and the bi-direction, and (ii) when the first coding cost of the forward prediction differs from the first coding cost of the backward prediction, the complex motion estimation portion selects one of the forward prediction and the backward prediction having a smaller first coding cost, and calculates the second coding cost for

the small blocks for one of the forward direction and the backward direction corresponding to the selected one of the forward prediction and the backward prediction, as recited in claim 38.

Furthermore, there is no disclosure or suggestion in Yang and/or Aono or elsewhere in the prior art of record which would have caused a person of ordinary skill in the art to modify Yang and/or Aono to obtain the invention of independent claim 38. Accordingly, it is respectfully submitted that independent claim 38 and claims 39-46, 49-55, 78-85 and 88-96 that depend therefrom are clearly allowable over the prior art of record.

Amended independent claims 72 and 78 are directed to a method and a program, respectively and each recites features that correspond to the above-mentioned distinguishing features of independent claim 38. Thus, for the same reasons discussed above, it is respectfully submitted that claims 72 and 78 are allowable over the prior art of record.

III. Conclusion

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance and an early notification thereof is earnestly requested. The Examiner is invited to contact the undersigned by telephone to resolve any remaining issues.

Respectfully submitted,

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